

STAFF SUMMARY SHEET

| | TO | ACTION | SIGNATURE (Surname), GRADE AND DATE | | TO | ACTION | SIGNATURE (Surname), GRADE AND DATE |
|------------------------------------------------------|------|---------|-------------------------------------|----------|----|-------------------|-------------------------------------|
| 1 | DFCS | sig | <i>Steve Hadfield, 06 MAR 12</i> | 6 | | | |
| 2 | DFER | approve | <i>Civ 22 MAR 12</i> | | | | |
| 3 | DFCS | action | | 8 | | | |
| | | | Steve Hadfield | | | | |
| 4 | | | | 9 | | | |
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| SURNAME OF ACTION OFFICER AND GRADE | | | SYMBOL | PHONE | | TYPIST'S INITIALS | SUSPENSE DATE |
| Steve Hadfield, Civ | | | DFCS | 333-7474 | | smh | |
| SUBJECT Clearance for Material for Public Release | | | | | | DATE | |
| USAFA-DF-PA-201 | | | | | | 20120321 | |

SUMMARY

1. PURPOSE. To provide security and policy review on the document at Tab 1 prior to release to the public.

2. BACKGROUND.

Author: Steve Hadfield

Title: Integrating Security and Software Assurance Concepts and Mindsets in an Undergraduate Computer Science Curriculum

Circle one: Abstract Tech Report Journal Article Speech Paper **Presentation** Poster

Thesis/Dissertation Book Other: _____

Check all that apply (For Communications Purposes):

CRADA (Cooperative Research and Development Agreement) exists

Photo/ Video Opportunities STEM-outreach Related New Invention/ Discovery/ Patent

Description: Invited talk at the Software Assurance Forum, Mclean, VA

Release Information:

Previous Clearance information: (If applicable): N/A

Recommended Distribution Statement: (Distribution A, Approved for public release, distribution unlimited.)

3. DISCUSSION. None.

4. VIEWS OF OTHERS. The Department Research Director has reviewed this paper and recommends it for public release.

5. RECOMMENDATION. Sign coord block above indicating document is suitable for public release. Suitability is based solely on the document being unclassified, not jeopardizing DoD interest, and accurately portraying official policy.

Steve Hadfield

STEVEN M. HADFIELD
Associate Professor

1 Tab
Presentation for approval

Integrating Software Assurance and Secure Programming Concepts and Mindsets into an Undergraduate Computer Science Program

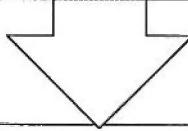
*Striving to Achieve the Goals of the
SEI/CERT Software Assurance Curriculum Project (Undergraduate)*



*Steve Hadfield
U.S. Air Force Academy, Department of Computer Science*

Realization

In an outcome-based curriculum, some outcomes need to be purposefully developed across courses and years.



Result

A retrospective, outcome-based look at an existing curriculum (Felder & Brent)

Key Cross Curricular Initiative

| | |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Software Engineering Discipline | <ul style="list-style-type: none"> • Needs Analysis, Requirements Elaboration, Design • Testing Rigor, Quality Assurance |
| Ethical, Legal, Social Issues | <ul style="list-style-type: none"> • Moral Frameworks & Decision Making • Ethical Codes (IEEE, ACM, Software Engineering) |
| Research Skills | <ul style="list-style-type: none"> • Literature Review, Framing/Scoping Topics, Hypotheses • Investigation, Support of Conclusion, Reporting |
| Communications Skills | <ul style="list-style-type: none"> • Oral Presentations • Written Communications |
| Team Work | <ul style="list-style-type: none"> • Team Building, Team Maintenance • Pair Programming, Four-Five Member Team Dynamics |
| Security & Software Assurance | <ul style="list-style-type: none"> • Secure Programming • Cyber Security |

Security & Software Assurance

| | |
|-------------------------------|-----------------------------------------|
| SEI/CERT SwA Curriculum | USAFA Computer Science |
| Computer Science I | Computer Science I |
| Computer Science II | Computer Science II |
| Intro to Computer Security | Computer Security & Information Warfare |
| Software Security Engineering | |
| Software Quality Assurance | |
| Software Assurance Analytics | Software Engineering I |
| Software Assurance Capstone | Software Engineering II |

Security & Software Assurance Initiative Sophomore Year

Computer Science I - Intro to Programming

- Input interpretation validation, array bounds checking
- Integer overflow, error/exception handling, file I/O issues

Computer Science II – Data Abstraction

- Pre- and post-conditions, more advanced debugging
- Testing & debugging techniques, reinforce CS I topics

Computer Organization & Architecture

- Data type overflow, divide-by-zero, round-off error
- Stack overflows

Security & Software Assurance Initiative Junior Year

Programming Paradigms

- Memory allocation/deallocation, termination conditions
- Stack/buffer overflows and protections, type safety

Operating Systems

- Deadlock issues, race conditions, system calls
- Signals, file system security

Databases & Web Programming

- Defense against SQL injection attacks
- Cross site scripting attacks

Networks

- Secure protocols, wireless encryption, Man-in-the-Middle attacks
- Adversarial view of protocols, network access control

Security & Software Assurance Initiative

Senior Year

Languages & Machines (compilers & language theory)

- Type checking mechanisms, array bounds checking mechanisms
- Translation to machine language

Computer Security & Information Warfare

- Security & threat models
- Range of security strategies and techniques

Software Engineering I

- Security requirements, security analysis of system design, risk management
- Formal test plans/procedures/reports
- Integration/system/regression/smoke/stress/security testing

Software Engineering II

- Introduction to Formal Methods
- Reengineering & forward engineering

Software Assurance & Security for ALL

Algorithmic Reasoning

Cyber Security

Input Validation

Information Security

Exception Prevention

Cryptography

Requirements Analysis

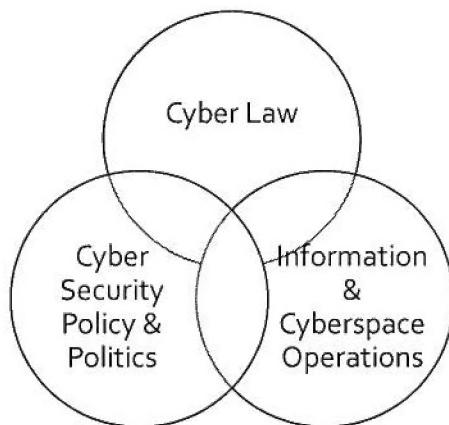
Cyber Warfare & Crime

Incremental Build/Test

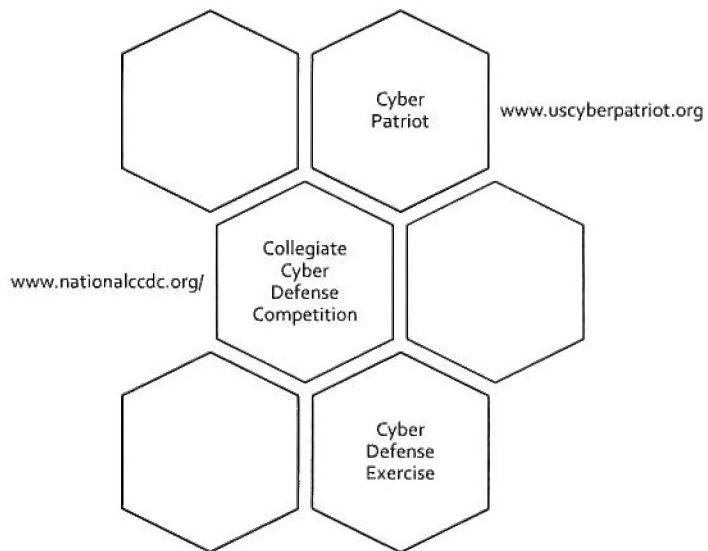
Offensive Cyber Ops

Defensive Cyber Ops

Enrichment Activities Interdisciplinary Courses



Enrichment Activities Defensive Competitions



Vectors

Professionals

- Comp Sci, Info Sys, Info Tech, MIS
- Curricular & pedagogical resources

General Awareness

- Personal awareness & defense
- Bigger issues – enterprise, national, global

Specialization

- Defense is the 'hard job'
- Funding for developing experts

Questions?



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